MB ALTERNATIVES RESEARCH IN CALIFORNIA PERENNIAL NURSERIES – WHERE ARE WE AFTER FIVE YEARS?

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The perennial crop nursery sector of the Pacific Area-Wide Pest Management Program for Methyl Bromide (MB) Alternatives has focused on open-field production of deciduous tree, grapevine, and garden rose planting stock in California. Concerns over plant parasitic nematodes and state regulations related to the Nursery Stock Nematode Certification program are the driving force behind soil fumigation in these nurseries. However, there are also serious concerns that the level of secondary pest control provided by MB will not be matched by the alternatives – particularly in the long-term.

For the past several years, research and extension efforts in California perennial crop nurseries have included testing of alternative fumigants, application techniques, surface seals, and integrated approaches to managing multiple soil-borne pests. Results of many of these collaborative projects have been presented at previous Annual International Research Conferences on Methyl Bromide Alternatives and Emissions Reductions (see MBAO.org) and in scientific publications (see literature list in this document). Much of this work has also been summarized in an article entitled "*A clean start to productive orchards and vineyards: research on methyl bromide alternatives for perennial crop nurseries*" recently submitted to the journal California Agriculture as well as in the Pacific-Area Wide Program for Methyl Bromide Alternative outreach website (http://ucanr.org/sites/PAWMBA/).

After five years of research, it remains clear that perennial crop nursery producers in California face a difficult transition to MB alternatives. Extremely low tolerances for nematodes, long growing cycles, as well as technical and regulatory hurdles continue to be significant challenges to widespread adoption of MB alternatives in this crop sector.

The most significant challenges include:

1. National and international market expectations for nematode-free nursery stock limit nursery stock producers to alternatives with very high nematode efficacy at significant depths in the soil.
2. To meet California nursery certification requirements, producers are required to use approved fumigant treatments or conduct a post-production inspection. A failed inspection may result in an essentially non-saleable crop.
3. Most alternative treatment schedules are based on the use of 1,3-D (with or without chloropicrin), a fumigant that faces its own serious and evolving regulatory issues in California.
4. No currently available alternative fumigant can be used in California to meet certification requirements in nurseries with fine-textured soil at registered rates.

5. Methyl iodide, the alternative fumigant with performance most similar to MB, is not currently registered in the U.S.
6. Concerns over control of weeds and fungal and bacterial pathogens in the short- and long-term may further limit adoption of alternatives with a narrower pest control spectrum.
7. Containerized nursery stock production systems are being used in some parts of the industry but the production costs, market acceptance, and long-term viability of this system have not been addressed at the required scale.

Adoption of MB alternatives, where they exist, in the perennial crop nursery industry will ultimately be driven by state and federal regulations and economics. Although dependent on another heavily regulated fumigant (1,3-D), a viable alternative is available for growers with coarse-textured soil. However, if 1,3-D becomes more difficult to use due to shortages or increasingly stringent regulations, this may provide only a short-term solution with no backup plan for these growers. No viable fumigant alternatives exist for California nurseries with fine-textured soil and some of these operations may be unable to produce certified nursery stock in the complete absence of MB. The cost of producing perennial nursery stock using more expensive, laborious, or economically risky production methods will ultimately be passed on to commercial and non-commercial customers and could have long-term impacts on the nursery, orchard, vineyard, and ornamental industries. While significant challenges remain for the perennial nursery industry, a full evaluation of the risks and benefits of nursery fumigation on the productivity of perennial cropping systems around the world is encouraged.

Literature and Outreach:

For an overview of the perennial nursery research conducted as a part of the Pacific-Area Wide Program for Methyl Bromide Alternatives, visit: http://ucanr.org/sites/PAWMBA/Nursery_Projects/Perennial/

Hanson, B.D., S. Gao, J. Gerik, R. Qin, J.A. Cabrera, A.J. Jhala, M.J.M. Abit, D. Cox, B. Correiar, D. Wang, and G.T. Browne. A clean start to productive orchards and vineyards: research on methyl bromide alternatives for perennial crop nurseries. (submitted to California Agriculture)

Abit, M.J.M. and B.D. Hanson. Evaluation of premergence and post-directed herbicides for weed control efficacy and crop safety in field nursery production of fruit and nut trees. (submitted to Hort Technology).

Jhala, A.J., S. Gao, J.S. Gerik, R. Qin, and B.D. Hanson. 2011. Effects of surface treatments and application shanks on nematode, pathogen and weed control with 1,3-dichloropropene. Pest Manage. Sci.68:225-230

Qin, R., S. Gao, H. Ajwa, D. Sullivan, D. Wang, and B.D. Hanson. 2011. Field evaluation of a new plastic film (Vapr Safe) to reduce fumigant emission and improve distribution in soil. JEQ 40:1195-1203

Gao, Hanson, Wang, Browne, Qin, Ajwa, and Yates. 2011. Methods for minimizing emissions from pre-plant soil fumigation. Calif. Agric. 65:41-46.

Hanson, B.D. S. Gao, J.S. Gerik, A. Shrestha, R. Qin, and J.A. McDonald. 2011. Effects of emission reduction surface seal treatments on pest control with shank-injected 1,3-dichloropropene and chloropicrin. Crop Prot. 30:203-207.

Gao, S., B.D. Hanson, R. Qin, D. Wang, and S. Yates. 2010. Comparisons of soil surface sealing methods to reduce fumigant emission loss. JEQ 40:1480-1487.

Zasada, I.A., T.W. Walters, and B.D. Hanson. 2010. Challenges in producing nematode- and pathogen-free fruit and nut nursery crops in the United States. Outlooks on Pest Management 21:246-250.

Hanson, B.D., J.S. Gerik, and S.M. Schneider. 2010. Effects of reduced rate methyl bromide applications under conventional and virtually impermeable plastic film in perennial crop field nurseries. Pest Manage. Sci. 66:892-899.

Qin, R., S. Gao, H. Ajwa, B.D. Hanson, T.J. Trout, D. Wang, and M. Guo. 2009. Interactive effect of organic amendment and environmental factors on degradation of 1,3-dichloropropene and chloropicrin in soil. JAFC 57:9063-9070.

Schneider, S.M. and B.D. Hanson. 2009. Effects of fumigant alternatives to methyl bromide on pest control in a deciduous fruit and nut plant nursery. HortTechnol. 19:526-532.

Schneider, S.M., B.D. Hanson, J.S. Gerik, T.J. Trout, A. Shrestha, and S. Gao. 2009. Comparison of shank- and drip-applied methyl bromide alternatives in perennial crop field nurseries. Hort Technol. 19:331-339.

Hanson, B.D. and S.M. Schneider. 2008. Evaluation of weed control and crop safety with herbicides in open field tree nurseries. Weed Technol. 22:493-498.

Gao, S., R. Qin, J.M. McDonald, B.D. Hanson, and T.J. Trout. 2008. Field tests of surface seals and soil treatments to reduce fumigant emissions from shank-injection of Telone C35. Sci. Total Environ. 405:206-214.